

Journal Dissection – Cell Signaling Pathways & Cancer

I. Background

A. Paragraph 1:

Angiogenesis:

Formation of new blood vessels, which can trigger the transition of tumors from a dormant state to a malignant one

Metastasis:

The spreading of a disease from one organ/place to another.

1. Explain what **VEGF** is and how it works.

B. Paragraph 2:

Dimerisation:

The joining of 2 inactive proteins to form a 2-part functioning protein (a dimer)

Constitutive:

Continuously active

1. What does **NGF** do?
2. Since NGF binds to a receptor, what is the vocabulary word for this type of molecule?
What 2 receptors does NGF bind to?
3. What happens to the Tyrosine Kinase Receptor (TrkA) when NGF binds to it?
4. Why do you suppose ‘overexpression’ of TrkA leads to worsening tumors, etc.?

Paragraph 3

1. What is this study's objective?

II. Materials & Methods

Choose any 5 sections to summarize. Include the basic materials & procedures.

1.

2.

3.

4.

5.

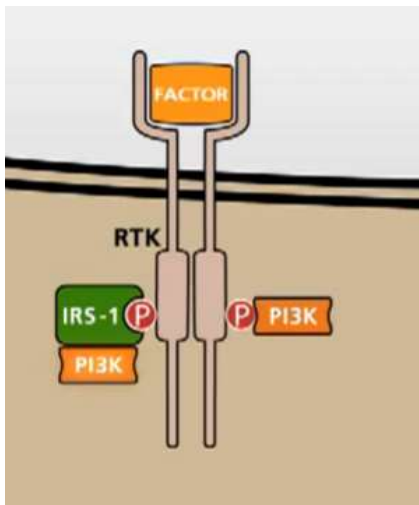
III. Results

Summarize each section of the results in plain language. Explaining the diagrams is not necessary.

IV. Discussion

Explain each section of the discussion. Make note of whether or not they address if their **original objective was met**. Also note any experimental **errors**, **unexpected results** and **extensions** of their work.

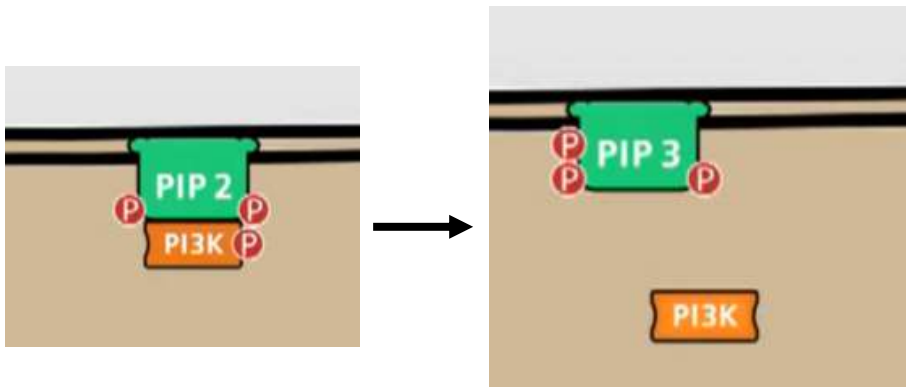
The PI3K/Akt Pathway



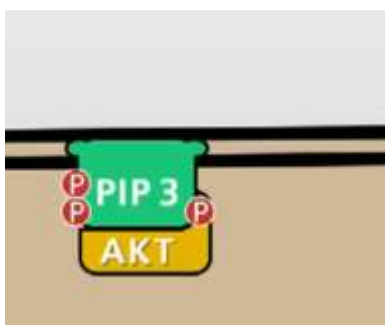
Factor such as VEGF or NGF binds to **RTK**

RTK is a Tyrosine Kinase Receptor (TrkA in the article)

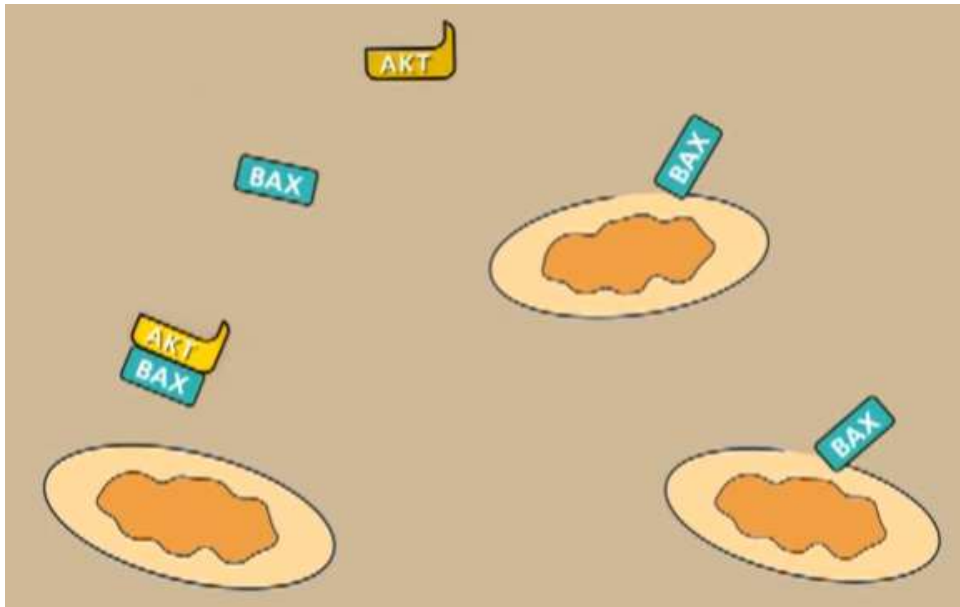
PI3K is an enzyme that is activated after a factor binds to the RTK.



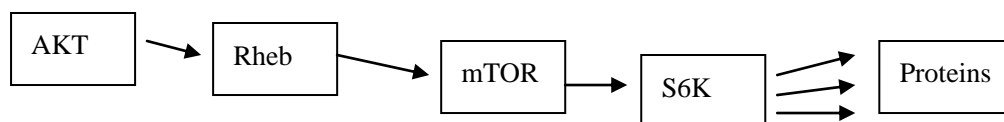
PIP 2 & PIP 3 are membrane-bound enzymes that can be activated by the enzyme PI3K



PIP 3 activates **AKT** (this is **Akt** in the article)

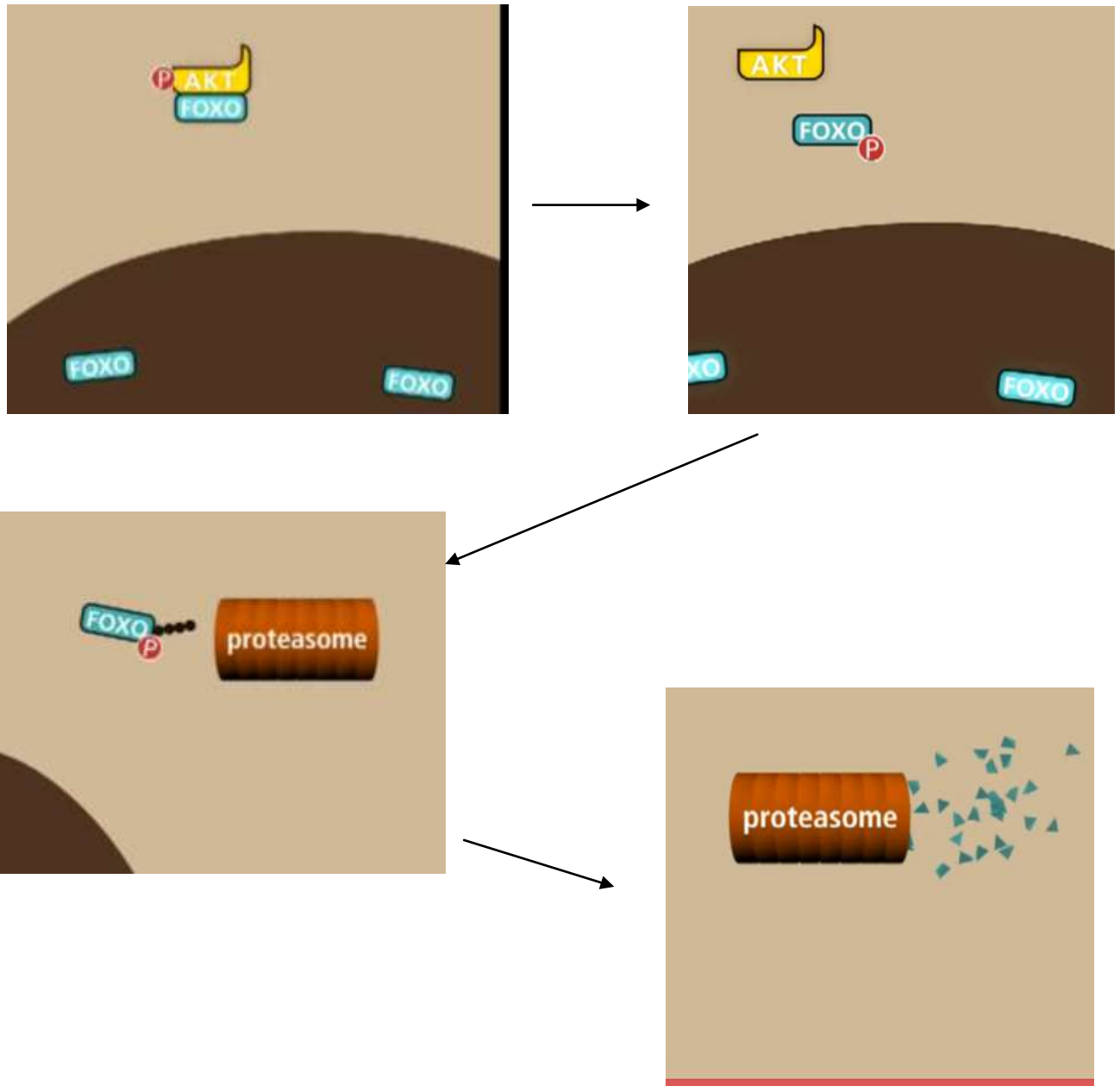


Activated **AKT** binds to **BAX**, inhibiting it. Look carefully at the cell without BAX attached, versus the cells with BAX attached... what does BAX do and how is it related to cancer?



AKT can also activate Rheb, which activates mTOR, which activates S6K, which activates **protein synthesis**. How is this related to cancer?

AKT can also inhibit **FOXO** which is a tumor suppressor.



Application to Chapter 11

Using the information from this activity and Chapter 11, answer the following questions:

1. What type of signaling pathway is The PI3K/Akt Pathway? (see notes, p. 25)

2. What type of receptor is used in this pathway? Explain the generalized activation & function of this receptor type (as listed in notes/text).

3. List the 3 stages of cell communication, and provide an example of each from the PI3K/Akt Pathway.
 - 1.
 - 2.
 - 3.

4. Which of the three “Second Messengers” is utilized in the The PI3K/Akt Pathway?

5. What is 1 method that could be used to fight cancer based on this article? Evaluate this method in terms of signaling pathways.

6. Discuss other parts of the pathway (Not discussed in the article!) that could be alternative modes of fighting this cancer.